



## 【特許請求の範囲】

【請求項1】 基台と、前記基台上に設けられた光ファイバ母材固定部材と、前記光ファイバ母材固定部材に固定された光ファイバ母材を前記光ファイバ母材固定部材とともに収納する収納容器と、前記収納容器内に清浄空気を供給する空気供給装置を備え、前記収納容器と前記空気供給装置は空気供給管で連結されており、前記空気供給装置より前記収納容器内に清浄空気を送り込むことにより前記収納容器内の雰囲気为正圧にすることを特徴とする光ファイバ母材の搬送装置。

【請求項2】 収納容器には清浄空気の排気孔が設けられており、該排気孔または前記空気供給管の少なくとも一方には圧力調整弁が設けられていることを特徴とする請求項1記載の光ファイバ母材の搬送装置。

【請求項3】 収納容器内に空気供給装置より清浄空気を送り込む空気供給管の清浄空気供給口が前記収納容器内の光ファイバ母材の長手方向全長にわたって所定間隔で設けられていることを特徴とする請求項1または請求項2記載の光ファイバ母材の搬送装置。

【請求項4】 基台は、基台に設けられたキャスタによって移動可能となっていることを特徴とする請求項1ないし請求項3記載の光ファイバ母材の搬送装置。

【請求項5】 基台は、レールにしたがって移動可能となっていることを特徴とする請求項1ないし請求項3記載の光ファイバ母材の搬送装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、光ファイバ母材を収納して搬送する装置に関するものである。

## 【0002】

【従来の技術】通常、光ファイバ母材は、クリーンルーム内に設置された光ファイバ母材製造装置、例えばVAD装置、脱水焼結装置等で製造される。VAD装置、脱水焼結装置等で製造された光ファイバ母材は、次工程の線引き装置に搬送されることになる。従来の搬送方法は、①作業者が直接手に持って搬送する、②光ファイバ母材専用のキャスタに載せて搬送する、③光ファイバ母材を容器内に収納してキャスタに載せて搬送する等であり、工場内のそれぞれの装置の配置等により適宜の方法で搬送している。

## 【0003】

【発明が解決しようとする課題】ところで、上記光ファイバ母材は外気に触れると品質が劣化するためクリーンルーム外には持ち出しが不可である。よって、その搬送は、全て光ファイバ母材製造装置や線引き装置が設置されている同一のクリーンルーム内で行われている。したがって、クリーンルーム内に光ファイバ母材搬送用の搬送ルートを設定する必要がある、上記の製造設備のスペースの他に搬送ルート用スペースを必要とするので、クリーンルームを有効に利用する上で問題があった。

【0004】本発明は上記の課題を解決し、クリーンルーム外でも搬送を可能にした光ファイバ母材の搬送装置を提供することを目的とするものである。

## 【0005】

【課題を解決するための手段】本発明は上記の課題を解決するために以下のような手段を有している。

【0006】本発明の請求項1の光ファイバ母材の搬送装置は、基台と、前記基台上に設けられた光ファイバ母材固定部材と、前記光ファイバ母材固定部材に固定された光ファイバ母材を前記光ファイバ母材固定部材とともに収納する収納容器と、前記収納容器内に清浄空気を供給する空気供給装置を備え、前記収納容器と前記空気供給装置は空気供給管で連結されており、前記空気供給装置より前記収納容器内に清浄空気を送り込むことにより前記収納容器内の雰囲気为正圧にすることを特徴とする。

【0007】本発明の請求項2の光ファイバ母材の搬送装置は、収納容器には清浄空気の排気孔が設けられており、該排気孔または空気供給管の少なくとも一方には圧力調整弁が設けられていることを特徴とする。

【0008】本発明の請求項3の光ファイバ母材の搬送装置は、収納容器内に空気供給装置より清浄空気を送り込む空気供給管の清浄空気供給口が前記収納容器内の光ファイバ母材の長手方向全長にわたって所定間隔で設けられていることを特徴とする。

【0009】本発明の請求項4の光ファイバ母材の搬送装置は、基台が、基台に設けられたキャスタによって移動可能となっていることを特徴とする。

【0010】本発明の請求項5の光ファイバ母材の搬送装置は、基台が、レールにしたがって移動可能となっていることを特徴とする。

【0011】本発明の請求項1の光ファイバ母材の搬送装置によれば、光ファイバ母材固定部材とともに光ファイバ母材が収納された収納容器内に空気供給装置から清浄空気を送り込んで収納容器内の雰囲気を正圧にするので、収納容器内には外気が入り込むことがない。したがって光ファイバ母材を収納した収納容器を有する光ファイバ母材の搬送装置をクリーンルームの外に出しても光ファイバ母材が外気に触れることなく搬送することが可能となる。その結果、光ファイバ母材をクリーンルーム内の搬送だけでなく、クリーンルームから一旦外に出して外の搬送ルートを通して別のクリーンルーム内の次工程の装置に移送することができる。よって、クリーンルーム内に搬送ルートを設定する必要がなくなり、クリーンルーム内の有効利用率を高くすることができる。

【0012】本発明の請求項2の光ファイバ母材の搬送装置によれば、収納容器には清浄空気の排気孔が設けられていて、この排気孔または空気供給管の少なくとも一方には圧力調整弁が設けられているので、収納容器内を確実に正圧とする事ができる。

【0013】本発明の請求項3の光ファイバ母材の搬送装置によれば、収納容器内に空気供給装置より清浄空気を送り込む空気供給管の清浄空気供給口が、収納容器内の光ファイバ母材の長手方向全長にわたって所定間隔で設けられているので、収納容器内の光ファイバ母材をその長手方向全長にわたって確実に清浄空気で覆うことができる。

【0014】本発明の請求項4の光ファイバ母材の搬送装置は、基台にキャスタが備えられているので、搬送装置を別の台車等に乗せることなくそのまま別の場所に移送することができる。

【0015】本発明の請求項5の光ファイバ母材の搬送装置は、基台が、レールにしたがって移動可能となっているので、自動化、無人化に適したものとなっている。

【0016】

【発明の実施の形態】

（実施の形態1）以下に本発明の実施の形態の一例についてより詳細に説明する。図1は、本発明の光ファイバ母材の搬送装置10の一部を縦に切開した説明図である。搬送装置10は、基台12、光ファイバ母材固定部材14、収納容器16および空気供給装置18を備えている。基台12には、キャスタ20が取り付けられていて、搬送装置10はそのまま台車として機能する。基台12の上部には、逆し字状に光ファイバ母材固定部材14が立設されている。光ファイバ母材固定部材14の上部の固定棒22に、光ファイバ母材1が係止されて固定される。

【0017】また、基台12の上部には、光ファイバ母材固定部材14全体を覆うように天板を有する筒状の収納容器16が載置されている。収納容器16の下部には、空気供給装置18に接続する空気供給管24が貫通している。空気供給管24の先端部は、収納容器16内で立ち上げられて、光ファイバ母材固定部材14に固定されるべき光ファイバ母材1に対して長手方向にわたって所定間隔に清浄空気を供給できるように複数の清浄空気供給口26が設けられている。収納容器16の上部には、清浄空気の排気孔28が設けられている。

【0018】また、収納容器16には図示していない光ファイバ母材1の出し入れのための開閉扉が気密に取り付けられている。すなわち、収納容器16は排気孔28を除いて全て気密の状態になっている。さらに、基台12の上部には、空気供給装置18が載置されている。空気供給装置18は、バッファタンク30および圧力調整弁32を有している。バッファタンク30は圧縮された清浄空気を貯蔵するもの、圧力調整弁32は収納容器16内に送り込む清浄空気の供給圧力を制御するものである。

【0019】上記のように構成された光ファイバ母材の搬送装置10を用いた光ファイバ母材1の搬送は以下のようにして行われる。まず、クリーンルーム内で収納容

器16の開閉扉を開いて図示していない脱水焼結装置等で製造された光ファイバ母材1を収納容器16内に収納する。光ファイバ母材1は、その種棒1Aの上部に形成された膨らみ頭部1Bを光ファイバ母材固定部材14の上部の固定棒22に設けられたU字状の切り欠きに嵌め込むことによって係止、固定される。上記の状態では、収納容器16の開閉扉を密閉して空気供給装置18の圧力調整弁32を開放してバッファタンク30内の清浄空気を収納容器16内に送り込む。収納容器16内はバッファタンク30より送り込まれた清浄空気により収納容器16の外より圧力が高くなり正圧となる。

【0020】したがって、収納容器16内には外部の空気が入ることがないので、そのままクリーンルーム外に出しても、光ファイバ母材1が外部の空気に触れることはない。また、収納容器16内の清浄空気は、収納容器内の光ファイバ母材の長手方向全長にわたって設けられている清浄空気供給口26より送り込まれるので、光ファイバ母材をその長手方向全長にわたって確実に清浄空気で覆うことができる。上記のようにして搬送装置10に光ファイバ母材1が収納されたら、搬送装置10に備えられているキャスタ20によって搬送装置10を所定の場所に搬送する。

【0021】また、図2に示すように、収納容器16の上部に設けられた排気孔28に圧力調整弁34を設けると、より確実に外部の空気の遮断が達成できる。

【0022】（実施の形態2）上記の実施の形態1の光ファイバ母材の搬送装置10の場合、バッファタンク30内の圧縮された清浄空気は、有限であるので搬送装置10をクリーンルーム外の搬送には時間的な限度がある。しかし図3に示すようにするとより長時間の搬送に耐えることができる。

【0023】図3の光ファイバ母材の搬送装置40の特徴は、空気供給装置42にある。空気供給装置42は、チャンバ44、コンプレッサ46およびフィルタ48を有していて、収納容器16の排気孔28には排気回収管50の一方が接続され、この排気回収管50の他方は圧力調整弁34を介して空気供給装置42のチャンバ44に連結している。

【0024】この光ファイバ母材の搬送装置40は、排気孔28より回収した清浄空気とチャンバ44の空気導入口52より新たに導入した外部の空気をコンプレッサ46で圧縮する。コンプレッサ46で圧縮された圧縮空気は、フィルタ48で清浄化されて圧力調整弁32を経て収納容器16内に送り込まれる。その他の構成は実施の形態1と同様につき同様の部材には同様の符号を付して詳細な説明を省略する。この光ファイバ母材の搬送装置40は、コンプレッサ46が稼働できる限り清浄空気を作ることができるので長時間のクリーンルーム外の搬送が可能となる。

【0025】なお、上記各実施の形態の形態において、

搬送装置がその移動手段としてキャスタを備えている例を示したが、移動手段はキャスタに限らない。例えば、モノレールホイストによって搬送装置を搬送できるようにしてもよい。このモノレールホイスト方式は自由なレール配置とすることができ、また分岐・交差等が可能となるので、より自動化、無人化に適した光ファイバ母材の搬送装置となる。

#### 【0026】

【発明の効果】以上述べたように、本発明の請求項1の光ファイバ母材の搬送装置によれば、光ファイバ母材固定部材とともに光ファイバ母材が収納された収納容器内に空気供給装置から清浄空気を送り込み、収納容器内の雰囲気清浄空気で正圧にするので、収納容器内に外気が入り込むことがなくない。したがって光ファイバ母材を収納した収納容器を有する光ファイバ母材の搬送装置をクリーンルーム外に出しても光ファイバ母材が外気に触れることなく搬送することが可能となる。その結果、光ファイバ母材をクリーンルーム内の搬送だけでなく、クリーンルームから一旦外に出して外の搬送ルートを通じて別のクリーンルームの次工程の装置に移送することができる。よってクリーンルーム内に搬送ルートを設置する必要がなくなり、クリーンルーム内の有効利用率を高くすることができる。

【0027】本発明の請求項2の光ファイバ母材の搬送装置によれば、収納容器には清浄空気の排気孔が設けられていて、この排気孔または空気供給管の少なくとも一方には圧力調整弁が設けられているので、収納容器内の清浄空気を確実に正圧とすることができる。

【0028】本発明の請求項3の光ファイバ母材の搬送装置によれば、収納容器内に空気供給装置より清浄空気を送り込む空気供給管の清浄空気供給口が、収納容器内の光ファイバ母材の長手方向全長にわたって所定間隔で

設けられているので、収納容器内の光ファイバ母材をその長手方向全長にわたって確実に清浄空気で覆うことができる。

【0029】本発明の請求項4の光ファイバ母材の搬送装置は、基台にキャスタが備えられているので、搬送装置を別の台車等に載せることなくそのまま別の場所に移送することができる。

【0030】本発明の請求項5の光ファイバ母材の搬送装置は、基台が、レールにしたがって移動可能となっているので、自動化、無人化に適したものとなっている。

#### 【図面の簡単な説明】

【図1】本発明の光ファイバ母材の搬送装置の実施の形態の一例を示す一部を縦に切開した正面図である。

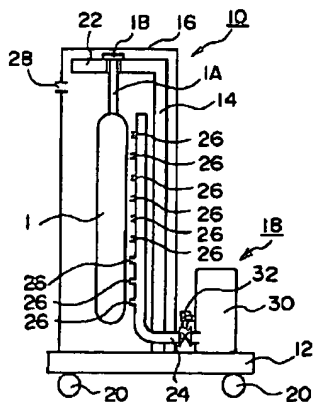
【図2】本発明の光ファイバ母材の搬送装置の他の実施の形態を示す正面図である。

【図3】本発明の光ファイバ母材の搬送装置のその他の実施の形態を示す正面図である。

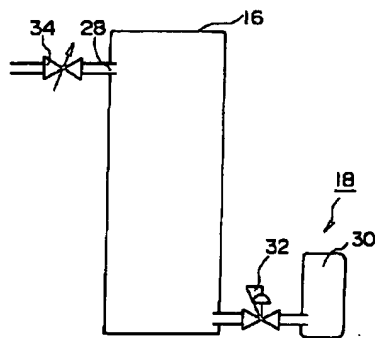
#### 【符号の説明】

- 1 光ファイバ母材
- 10 光ファイバ母材の搬送装置
- 12 基台
- 14 光ファイバ母材固定部材
- 16 収納容器
- 18 空気供給装置
- 20 キャスタ
- 24 空気供給管
- 26 清浄空気供給口
- 28 排気孔
- 32 圧力調整弁
- 34 圧力調整弁
- 40 光ファイバ母材の搬送装置
- 42 清浄空気装置

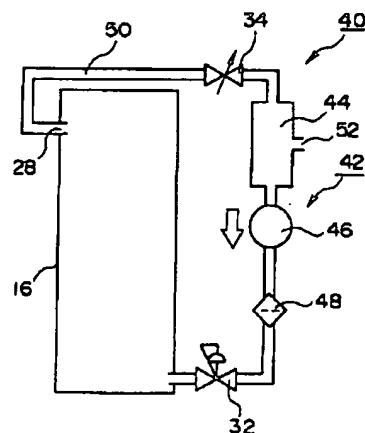
【図1】



【図2】



【図3】



# PATENT ABSTRACTS OF JAPAN

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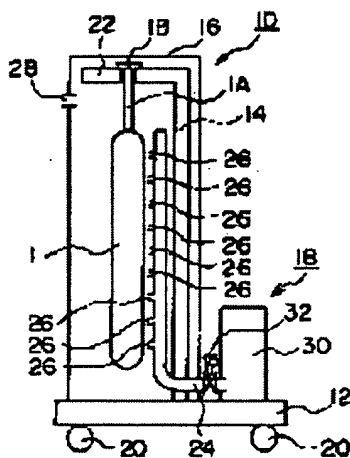
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## (54) APPARATUS FOR TRANSPORTING OPTICAL FIBER PREFORM

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an apparatus for transporting an optical fiber preform capable of transporting the preform outside a clean room as well.

SOLUTION: This apparatus has a base plate 12, an optical fiber preform fixing member 14 which is disposed on the base plate 12, an housing vessel 16 which houses the optical fiber preform 1 fixed onto the optical fiber preform fixing member 14 together with the optical fiber preform fixing member 14 and an air supplying device 18 which supplies clean air into the housing vessel 16. The housing vessel 16 and the air supplying device 18 are connected by an air supplying pipe 24. Clean air is fed into the housing vessel 16 from the air supplying device 18, by which the atmosphere in the housing vessel 16 is held at a positive pressure with the clean air.



## LEGAL STATUS

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## CLAIMS

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[Claim(s)]

[Claim 1] The stowage container which contains a pedestal, the optical fiber preform holddown member prepared on said pedestal, and the optical fiber preform fixed to said optical fiber preform holddown member with said optical fiber preform holddown member, Have air supply equipment which supplies clarification air in said stowage container, and said stowage container and said air supply equipment are connected with air supply tubing. The transport device of the optical fiber preform characterized by making the ambient atmosphere in said stowage container into positive pressure by sending in clarification air in said stowage container from said air supply equipment.

[Claim 2] The transport device of the optical fiber preform according to claim 1 characterized by preparing the exhaust hole of clarification air in the stowage container, and preparing the pressure regulating valve in either [ at least ] this exhaust hole or said air supply tubing.

[Claim 3] The transport device of the optical fiber preform according to claim 1 or 2 characterized by preparing clarification air supply opening of air supply tubing which sends in clarification air at intervals of predetermined covering the longitudinal direction overall length of the optical fiber preform in said stowage container from air supply equipment in a stowage container.

[Claim 4] A pedestal is the transport device of claim 1 characterized by being movable by the axle-pin rake prepared in the pedestal thru/or an optical fiber preform according to claim 3.

[Claim 5] A pedestal is the transport device of claim 1 characterized by being movable according to a rail thru/or an optical fiber preform according to claim 3.

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the equipment which contains and conveys an optical fiber preform.

[0002]

[Description of the Prior Art] Usually, an optical fiber preform is manufactured with the optical fiber preform manufacturing installation installed in the clean room, for example, VAD equipment, dehydration sintering equipment, etc. The optical fiber preform manufactured with VAD equipment, dehydration sintering equipment, etc. will be conveyed by the drawing equipment of degree process. The conventional conveyance approach contains in a container \*\* optical fiber preform which \*\* operator has in a direct hand and conveys and which is carried and conveyed to the axle-pin rake only for \*\* optical fiber preforms, is carrying and conveying to an axle-pin rake etc., and is conveying it by the proper approach by arrangement of each equipment in works etc.

[0003]

[Problem(s) to be Solved by the Invention] By the way, since quality will deteriorate if the open air is touched on, the above-mentioned optical fiber preform cannot be carried out outside a clean room. Therefore, the whole of the conveyance is performed in the same clean room in which an optical fiber preform manufacturing installation and drawing equipment are installed. Therefore, since the traveling route for optical fiber preform conveyance needed to be prepared and the tooth space for traveling routes other than the tooth space of the above-mentioned manufacturing facility was needed in the clean room, when using a clean room effectively, there was a problem.

[0004] This invention solves the above-mentioned technical problem, and it aims at offering the transport device of the optical fiber preform which made conveyance possible also out of the clean room.

[0005]

[Means for Solving the Problem] This invention has the following means, in order to solve the above-mentioned technical problem.

[0006] The transport device of the optical fiber preform of claim 1 of this invention The stowage container which contains a pedestal, the optical fiber preform holddown member prepared on said pedestal, and the optical fiber preform fixed to said optical fiber preform holddown member with said optical fiber preform holddown member, It has air supply equipment which supplies clarification air in said stowage container, said stowage container and said air supply equipment are connected with air supply tubing, and it is characterized by making the ambient atmosphere in said stowage container into positive pressure by sending in clarification air in said stowage container from said air supply equipment.

[0007] The transport device of the optical fiber preform of claim 2 of this invention is characterized by preparing the exhaust hole of clarification air in the stowage container, and preparing the pressure regulating valve in either [ at least ] this exhaust hole or air supply tubing.

[0008] The transport device of the optical fiber preform of claim 3 of this invention is characterized by preparing clarification air supply opening of air supply tubing which sends in clarification air at intervals of predetermined covering the longitudinal direction overall length of the optical fiber preform in said stowage container from air supply equipment in a stowage container.

[0009] The transport device of the optical fiber preform of claim 4 of this invention is characterized by being movable by the axle-pin rake by which the pedestal was prepared in the pedestal.

[0010] It is characterized by the transport device of the optical fiber preform of claim 5 of this invention having a movable pedestal according to a rail.

[0011] Since according to the transport device of the optical fiber preform of claim 1 of this invention clarification air is sent in from air supply equipment in the stowage container with which the optical fiber preform was contained and the ambient atmosphere in a stowage container is made into positive pressure with an optical fiber preform holddown member, the open air does not enter in a stowage container. Therefore, it becomes possible to convey without an optical fiber preform touching on the open air, even if it takes out the transport device of the optical fiber preform which has the stowage container which contained the optical fiber preform out of a clean room. Consequently, an optical fiber preform can once be taken out not only from conveyance in a clean room but from a clean room outside, and it can transport to the equipment of degree process in another clean room through an outer traveling route. Therefore, it becomes unnecessary to prepare a traveling route in a clean room, and the effective utilization factor in a clean room can be made high.

[0012] Since according to the transport device of the optical fiber preform of claim 2 of this invention the exhaust hole of clarification air is prepared in the stowage container and the pressure regulating valve is prepared in either [ at least ] this exhaust hole or air supply tubing, the inside of a stowage container can be certainly made into positive pressure.

[0013] According to the transport device of the optical fiber preform of claim 3 of this invention, since clarification air supply opening of air supply tubing which sends in clarification air from air supply equipment in a stowage container is prepared at intervals of predetermined covering the longitudinal direction overall length of the optical fiber preform in a stowage container, it can cover the optical fiber preform in a stowage container with clarification air certainly covering the longitudinal direction overall length.

[0014] Since the pedestal is equipped with the axle-pin rake, the transport device of the optical fiber preform of claim 4 of this invention can be transported to somewhere else as it is, without putting a transport device on another truck etc.

[0015] The transport device of the optical fiber preform of claim 5 of this invention is that to which it was suitable for automation and full automation since the pedestal was movable according to the rail.

[0016]

[Embodiment of the Invention]

(Gestalt 1 of operation) An example of the gestalt of the operation of this invention to the following is explained more to a detail. Drawing 1 is the explanatory view which cut open perpendicularly a part of transport device 10 of the optical fiber preform of this invention. The transport device 10 is equipped with a pedestal 12, the optical fiber preform holddown member 14, a stowage container 16, and air supply equipment 18. The axle-pin rake 20 is attached in the pedestal 12, and a transport device 10 functions on it as a truck as it is. The optical fiber preform holddown member 14 is set up by inverse L-shaped in the upper part of a pedestal 12. An optical fiber preform 1 is stopped and fixed to the tie rod 22 of the upper part of the optical fiber preform holddown member 14.

[0017] Moreover, the tubed stowage container 16 which has a top plate so that the optical fiber preform holddown-member 14 whole may be covered is laid in the upper part of a pedestal 12. In the lower part of a stowage container 16, the air supply tubing 24 it



connects [ air supply / equipment / 18 / air supply ] has penetrated. The point of the air supply tubing 24 is started within a stowage container 16, and two or more clarification air supply openings 26 are formed so that clarification air can be supplied to predetermined spacing over a longitudinal direction to the optical fiber preform 1 which should be fixed to the optical fiber preform holddown member 14. The exhaust hole 28 of clarification air is formed in the upper part of a stowage container 16.

[0018] Moreover, the closing motion door for receipts and payments of the optical fiber preform 1 which is not illustrated is airtightly attached in the stowage container 16. Namely, the stowage container 16 is in the airtight condition altogether except for the exhaust hole 28. Furthermore, air supply equipment 18 is laid in the upper part of a pedestal 12. Air supply equipment 18 has the buffer tank 30 and the pressure regulating valve 32. What stores the clarification air into which the buffer tank 30 was compressed, and a pressure regulating valve 32 control the supply pressure of the clarification air sent in in a stowage container 16.

[0019] Conveyance of the optical fiber preform 1 using the transport device 10 of the optical fiber preform constituted as mentioned above is performed as follows. First, the optical fiber preform 1 manufactured with the dehydration sintering equipment which is not opening and illustrating the closing motion door of a stowage container 16 in a clean room is contained in a stowage container 16. An optical fiber preform 1 is stopped and fixed by inserting in U character-like notching which was formed in the upper part of the \*\*\*\* 1A and in which it swelled and head 1B was prepared by the tie rod 22 of the upper part of the optical fiber preform holddown member 14. The closing motion door of a stowage container 16 is sealed in the above-mentioned condition, the pressure regulating valve 32 of air supply equipment 18 is opened, and the clarification air in the buffer tank 30 is sent in in a stowage container 16. A pressure becomes high from the outside of a stowage container 16 with the clarification air sent in from the buffer tank 30, and the inside of a stowage container 16 serves as positive pressure.

[0020] Therefore, since external air does not enter in a stowage container 16, even if it takes out outside a clean room as it is, an optical fiber preform 1 does not touch external air. Moreover, since the clarification air in a stowage container 16 is sent in from the clarification air supply opening 26 prepared covering the longitudinal direction overall length of the optical fiber preform in a stowage container, it can cover an optical fiber preform with clarification air certainly covering the longitudinal direction overall length. If an optical fiber preform 1 is contained by the transport device 10 as mentioned above, a transport device 10 will be conveyed in a predetermined location by the axle-pin rake 20 with which the transport device 10 is equipped.

[0021] Moreover, if a pressure regulating valve 34 is formed in the exhaust hole 28 prepared in the upper part of a stowage container 16 as shown in drawing 2 , cutoff of external air can be attained more certainly.

[0022] (Gestalt 2 of operation) In the case of the transport device 10 of the optical fiber preform of the gestalt 1 of the above-mentioned operation, since the clarification air into which it was compressed in the buffer tank 30 is limited, there is a time limit in conveyance outside a clean room about a transport device 10. However, if it is made to be shown in drawing 3 , it can be equal to more nearly prolonged conveyance.

[0023] The description of the transport device 40 of the optical fiber preform of drawing 3 is in air supply equipment 42. It has the chamber 44, the compressor 46, and the filter

48, one side of the exhaust air recovery tubing 50 was connected to the exhaust hole 28 of a stowage container 16, and air supply equipment 42 has connected another side of this exhaust air recovery tubing 50 with the chamber 44 of air supply equipment 42 through a pressure regulating valve 34.

[0024] The transport device 40 of this optical fiber preform compresses the clarification air collected from the exhaust hole 28, and the air of the more newly than the air induction inlet 52 of a chamber 44 introduced exterior by the compressor 46. The compressed air compressed by the compressor 46 is defecated with a filter 48, and is sent in in a stowage container 16 through a pressure regulating valve 32. Other configurations are attached like the gestalt 1 of operation, give the same sign to the same member, and omit detailed explanation. Since the transport device 40 of this optical fiber preform can make clarification air as long as it can work a compressor 46, conveyance of it outside a prolonged clean room is attained.

[0025] In addition, in the gestalt of the gestalt of each above-mentioned implementation, although the example which the transport device equips with the axle-pin rake as the migration means was shown, a migration means is not restricted to an axle-pin rake. For example, you may enable it to convey a transport device with a monorail hoist. Since this monorail hoist method can be considered as free rail arrangement and branching, the crossover, etc. of it are attained, it becomes the transport device of the optical fiber preform which was more suitable for automation and full automation.

[0026]

[Effect of the Invention] Since according to the transport device of the optical fiber preform of claim 1 of this invention clarification air is sent in from air supply equipment in the stowage container with which the optical fiber preform was contained with the optical fiber preform holddown member and the ambient atmosphere in a stowage container is made into positive pressure with clarification air as stated above, the open air does not enter in a stowage container. Therefore, it becomes possible to convey without an optical fiber preform touching on the open air, even if it takes out the transport device of the optical fiber preform which has the stowage container which contained the optical fiber preform outside a clean room. Consequently, an optical fiber preform can once be taken out not only from conveyance in a clean room but from a clean room outside, and it can transport to the equipment of degree process of another clean room through an outer traveling route. Therefore, it becomes unnecessary to prepare a traveling route in a clean room, and the effective utilization factor in a clean room can be made high.

[0027] Since according to the transport device of the optical fiber preform of claim 2 of this invention the exhaust hole of clarification air is prepared in the stowage container and the pressure regulating valve is prepared in either [ at least ] this exhaust hole or air supply tubing, clarification air in a stowage container can be certainly made into positive pressure.

[0028] According to the transport device of the optical fiber preform of claim 3 of this invention, since clarification air supply opening of air supply tubing which sends in clarification air from air supply equipment in a stowage container is prepared at intervals of predetermined covering the longitudinal direction overall length of the optical fiber preform in a stowage container, it can cover the optical fiber preform in a stowage container with clarification air certainly covering the longitudinal direction overall length.

[0029] Since the pedestal is equipped with the axle-pin rake, the transport device of the

optical fiber preform of claim 4 of this invention can be transported to somewhere else as it is, without putting a transport device on another truck etc.

[0030] The transport device of the optical fiber preform of claim 5 of this invention is that to which it was suitable for automation and full automation since the pedestal was movable according to the rail.

## TECHNICAL FIELD

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[Field of the Invention] This invention relates to the equipment which contains and conveys an optical fiber preform.

## PRIOR ART

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[Description of the Prior Art] Usually, an optical fiber preform is manufactured with the optical fiber preform manufacturing installation installed in the clean room, for example, VAD equipment, dehydration sintering equipment, etc. The optical fiber preform manufactured with VAD equipment, dehydration sintering equipment, etc. will be conveyed by the drawing equipment of degree process. The conventional conveyance approach contains in a container \*\* optical fiber preform which \*\* operator has in a direct hand and conveys and which is carried and conveyed to the axle-pin rake only for \*\* optical fiber preforms, is carrying and conveying to an axle-pin rake etc., and is conveying it by the proper approach by arrangement of each equipment in works etc.

## EFFECT OF THE INVENTION

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[Effect of the Invention] Since according to the transport device of the optical fiber preform of claim 1 of this invention clarification air is sent in from air supply equipment in the stowage container with which the optical fiber preform was contained with the optical fiber preform holddown member and the ambient atmosphere in a stowage container is made into positive pressure with clarification air as stated above, the open air does not enter in a stowage container. Therefore, it becomes possible to convey without an optical fiber preform touching on the open air, even if it takes out the transport device of the optical fiber preform which has the stowage container which contained the optical fiber preform outside a clean room. Consequently, an optical fiber preform can once be taken out not only from conveyance in a clean room but from a clean room outside, and it can transport to the equipment of degree process of another clean room through an outer traveling route. Therefore, it becomes unnecessary to prepare a traveling route in a clean room, and the effective utilization factor in a clean room can be made high.

[0027] Since according to the transport device of the optical fiber preform of claim 2 of this invention the exhaust hole of clarification air is prepared in the stowage container and the pressure regulating valve is prepared in either [ at least ] this exhaust hole or air supply tubing, clarification air in a stowage container can be certainly made into positive pressure.

[0028] According to the transport device of the optical fiber preform of claim 3 of this invention, since clarification air supply opening of air supply tubing which sends in clarification air from air supply equipment in a stowage container is prepared at intervals

of predetermined covering the longitudinal direction overall length of the optical fiber preform in a stowage container, it can cover the optical fiber preform in a stowage container with clarification air certainly covering the longitudinal direction overall length.

[0029] Since the pedestal is equipped with the axle-pin rake, the transport device of the optical fiber preform of claim 4 of this invention can be transported to somewhere else as it is, without putting a transport device on another truck etc.

[0030] The transport device of the optical fiber preform of claim 5 of this invention is that to which it was suitable for automation and full automation since the pedestal was movable according to the rail.

## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] By the way, since quality will deteriorate if the open air is touched on, the above-mentioned optical fiber preform cannot be carried out outside a clean room. Therefore, the whole of the conveyance is performed in the same clean room in which an optical fiber preform manufacturing installation and drawing equipment are installed. Therefore, since the traveling route for optical fiber preform conveyance needed to be prepared and the tooth space for traveling routes other than the tooth space of the above-mentioned manufacturing facility was needed in the clean room, when using a clean room effectively, there was a problem.

[0004] This invention solves the above-mentioned technical problem, and it aims at offering the transport device of the optical fiber preform which made conveyance possible also out of the clean room.

## MEANS

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[Means for Solving the Problem] This invention has the following means, in order to solve the above-mentioned technical problem.

[0006] The transport device of the optical fiber preform of claim 1 of this invention The stowage container which contains a pedestal, the optical fiber preform holddown member prepared on said pedestal, and the optical fiber preform fixed to said optical fiber preform holddown member with said optical fiber preform holddown member, It has air supply equipment which supplies clarification air in said stowage container, said stowage container and said air supply equipment are connected with air supply tubing, and it is characterized by making the ambient atmosphere in said stowage container into positive pressure by sending in clarification air in said stowage container from said air supply equipment.

[0007] The transport device of the optical fiber preform of claim 2 of this invention is characterized by preparing the exhaust hole of clarification air in the stowage container, and preparing the pressure regulating valve in either [ at least ] this exhaust hole or air supply tubing.

[0008] The transport device of the optical fiber preform of claim 3 of this invention is characterized by preparing clarification air supply opening of air supply tubing which sends in clarification air at intervals of predetermined covering the longitudinal direction overall length of the optical fiber preform in said stowage container from air supply equipment in a stowage container.

[0009] The transport device of the optical fiber preform of claim 4 of this invention is characterized by being movable by the axle-pin rake by which the pedestal was prepared in the pedestal.

[0010] It is characterized by the transport device of the optical fiber preform of claim 5 of this invention having a movable pedestal according to a rail.

[0011] Since according to the transport device of the optical fiber preform of claim 1 of this invention clarification air is sent in from air supply equipment in the stowage container with which the optical fiber preform was contained and the ambient atmosphere in a stowage container is made into positive pressure with an optical fiber preform holddown member, the open air does not enter in a stowage container. Therefore, it becomes possible to convey without an optical fiber preform touching on the open air, even if it takes out the transport device of the optical fiber preform which has the stowage container which contained the optical fiber preform out of a clean room. Consequently, an optical fiber preform can once be taken out not only from conveyance in a clean room but from a clean room outside, and it can transport to the equipment of degree process in another clean room through an outer traveling route. Therefore, it becomes unnecessary to prepare a traveling route in a clean room, and the effective utilization factor in a clean room can be made high.

[0012] Since according to the transport device of the optical fiber preform of claim 2 of this invention the exhaust hole of clarification air is prepared in the stowage container and the pressure regulating valve is prepared in either [ at least ] this exhaust hole or air supply tubing, the inside of a stowage container can be certainly made into positive pressure.

[0013] According to the transport device of the optical fiber preform of claim 3 of this invention, since clarification air supply opening of air supply tubing which sends in clarification air from air supply equipment in a stowage container is prepared at intervals of predetermined covering the longitudinal direction overall length of the optical fiber preform in a stowage container, it can cover the optical fiber preform in a stowage container with clarification air certainly covering the longitudinal direction overall length.

[0014] Since the pedestal is equipped with the axle-pin rake, the transport device of the optical fiber preform of claim 4 of this invention can be transported to somewhere else as it is, without putting a transport device on another truck etc.

[0015] The transport device of the optical fiber preform of claim 5 of this invention is that to which it was suitable for automation and full automation since the pedestal was movable according to the rail.

[0016]

[Embodiment of the Invention]

(Gestalt 1 of operation) An example of the gestalt of the operation of this invention to the following is explained more to a detail. Drawing 1 is the explanatory view which cut open perpendicularly a part of transport device 10 of the optical fiber preform of this invention. The transport device 10 is equipped with a pedestal 12, the optical fiber preform holddown member 14, a stowage container 16, and air supply equipment 18. The axle-pin rake 20 is attached in the pedestal 12, and a transport device 10 functions on it as a truck as it is. The optical fiber preform holddown member 14 is set up by inverse L-shaped in the upper part of a pedestal 12. An optical fiber preform 1 is stopped and fixed to the tie rod 22 of the upper part of the optical fiber preform holddown member 14.

[0017] Moreover, the tubed stowage container 16 which has a top plate so that the optical fiber preform holddown-member 14 whole may be covered is laid in the upper part of a pedestal 12. In the lower part of a stowage container 16, the air supply tubing 24 it connects [ air supply / equipment / 18 / air supply ] has penetrated. The point of the air supply tubing 24 is started within a stowage container 16, and two or more clarification air supply openings 26 are formed so that clarification air can be supplied to predetermined spacing over a longitudinal direction to the optical fiber preform 1 which should be fixed to the optical fiber preform holddown member 14. The exhaust hole 28 of clarification air is formed in the upper part of a stowage container 16.

[0018] Moreover, the closing motion door for receipts and payments of the optical fiber preform 1 which is not illustrated is airtightly attached in the stowage container 16. Namely, the stowage container 16 is in the airtight condition altogether except for the exhaust hole 28. Furthermore, air supply equipment 18 is laid in the upper part of a pedestal 12. Air supply equipment 18 has the buffer tank 30 and the pressure regulating valve 32. What stores the clarification air into which the buffer tank 30 was compressed, and a pressure regulating valve 32 control the supply pressure of the clarification air sent in in a stowage container 16.

[0019] Conveyance of the optical fiber preform 1 using the transport device 10 of the optical fiber preform constituted as mentioned above is performed as follows. First, the optical fiber preform 1 manufactured with the dehydration sintering equipment which is not opening and illustrating the closing motion door of a stowage container 16 in a clean room is contained in a stowage container 16. An optical fiber preform 1 is stopped and fixed by inserting in U character-like notching which was formed in the upper part of the \*\*\*\* 1A and in which it swelled and head 1B was prepared by the tie rod 22 of the upper part of the optical fiber preform holddown member 14. The closing motion door of a stowage container 16 is sealed in the above-mentioned condition, the pressure regulating valve 32 of air supply equipment 18 is opened, and the clarification air in the buffer tank 30 is sent in in a stowage container 16. A pressure becomes high from the outside of a stowage container 16 with the clarification air sent in from the buffer tank 30, and the inside of a stowage container 16 serves as positive pressure.

[0020] Therefore, since external air does not enter in a stowage container 16, even if it takes out outside a clean room as it is, an optical fiber preform 1 does not touch external air. Moreover, since the clarification air in a stowage container 16 is sent in from the clarification air supply opening 26 prepared covering the longitudinal direction overall length of the optical fiber preform in a stowage container, it can cover an optical fiber preform with clarification air certainly covering the longitudinal direction overall length. If an optical fiber preform 1 is contained by the transport device 10 as mentioned above, a transport device 10 will be conveyed in a predetermined location by the axle-pin rake 20 with which the transport device 10 is equipped.

[0021] Moreover, if a pressure regulating valve 34 is formed in the exhaust hole 28 prepared in the upper part of a stowage container 16 as shown in drawing 2, cutoff of external air can be attained more certainly.

[0022] (Gestalt 2 of operation) In the case of the transport device 10 of the optical fiber preform of the gestalt 1 of the above-mentioned operation, since the clarification air into which it was compressed in the buffer tank 30 is limited, there is a time limit in conveyance outside a clean room about a transport device 10. However, if it is made to be

shown in drawing 3 , it can be equal to more nearly prolonged conveyance.

[0023] The description of the transport device 40 of the optical fiber preform of drawing 3 is in air supply equipment 42. It has the chamber 44, the compressor 46, and the filter 48, one side of the exhaust air recovery tubing 50 was connected to the exhaust hole 28 of a stowage container 16, and air supply equipment 42 has connected another side of this exhaust air recovery tubing 50 with the chamber 44 of air supply equipment 42 through a pressure regulating valve 34.

[0024] The transport device 40 of this optical fiber preform compresses the clarification air collected from the exhaust hole 28, and the air of the more newly than the air induction inlet 52 of a chamber 44 introduced exterior by the compressor 46. The compressed air compressed by the compressor 46 is defecated with a filter 48, and is sent in in a stowage container 16 through a pressure regulating valve 32. Other configurations are attached like the gestalt 1 of operation, give the same sign to the same member, and omit detailed explanation. Since the transport device 40 of this optical fiber preform can make clarification air as long as it can work a compressor 46, conveyance of it outside a prolonged clean room is attained.

[0025] In addition, in the gestalt of the gestalt of each above-mentioned implementation, although the example which the transport device equips with the axle-pin rake as the migration means was shown, a migration means is not restricted to an axle-pin rake. For example, you may enable it to convey a transport device with a monorail hoist. Since this monorail hoist method can be considered as free rail arrangement and branching, the crossover, etc. of it are attained, it becomes the transport device of the optical fiber preform which was more suitable for automation and full automation.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the front view which cut open perpendicularly the part which shows an example of the gestalt of operation of the transport device of the optical fiber preform of this invention.

[Drawing 2] It is the front view showing the gestalt of other operations of the transport device of the optical fiber preform of this invention.

[Drawing 3] It is the front view showing the gestalt of operation of others of the transport device of the optical fiber preform of this invention.

[Description of Notations]

1 Optical Fiber Preform

10 Transport Device of Optical Fiber Preform

12 Pedestal

14 Optical Fiber Preform Holddown Member

16 Stowage Container

18 Air Supply Equipment

20 Axle-pin Rake

24 Air Supply Tubing

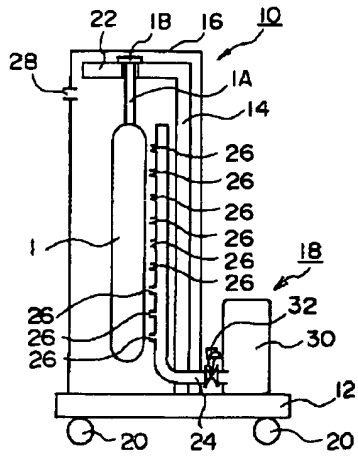
26 Clarification Air Supply Opening

28 Exhaust Hole

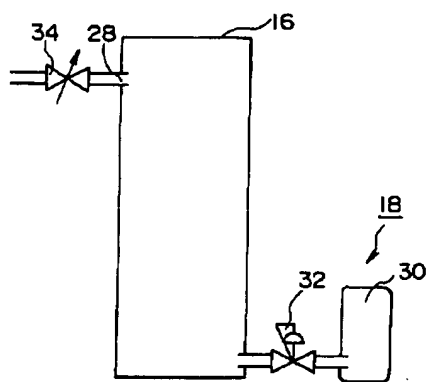
32 Pressure Regulating Valve

34 Pressure Regulating Valve  
40 Transport Device of Optical Fiber Preform  
42 Clarification Air Equipment

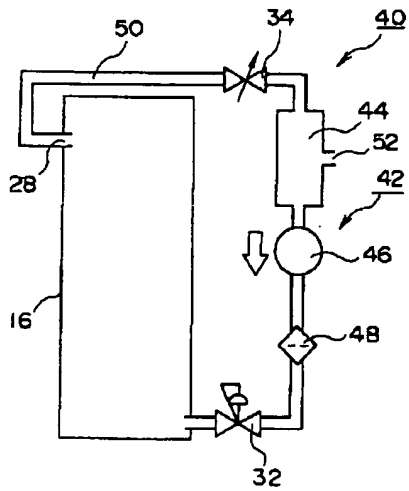


Drawing selection 

[Translation done.]

Drawing selection drawing 2

[Translation done.]

Drawing selection drawing 3

[Translation done.]